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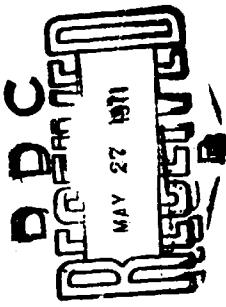
SELECTED BIVARIATE ANTHROPOMETRIC DISTRIBUTIONS DESCRIBING A SAMPLE OF NAVAL AVIATORS - 1964

William F. Moroney



March 1971

NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY
PENSACOLA, FLORIDA



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SUMMARY PAGE

THE PROBLEM

Previous anthropometric surveys presented means, standard deviations, ranges, and percentiles as descriptors of the anthropometric features of aviator populations. These reports were limited to a consideration of each variable independently. However, designers also need knowledge of the interaction between variables in order to determine what proportion of the potential operator population their design decisions will eliminate. This report extends data previously collected from 1549 naval aviation personnel by presenting bivariate tables that illustrate the relationship between selected variables.

FINDINGS

Twenty-one tables were prepared that contain selected interactions between the following variables: bideltoid diameter; buttock/knee length; eye height; sitting; functional reach; head height; knee height; sitting; shoulder height; sitting; standing height; and thigh circumference. Means, standard deviations, ranges, regression equations, standard error of estimate, and percentile levels were also presented for each variable.

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INTRODUCTION

An earlier report by Gifford, Provost, and Lazo (1) presented the results of a survey of the anthropometric features of 1549 naval aviators. Means, standard deviations, ranges, and percentiles were presented for each of 96 dimensions. The report was restricted to a consideration of each dimension independently and did not include the relationship between variables. The purpose of the present report is to extend those data by presenting bivariate tables that illustrate the relationship between selected variables. These tables, hopefully, will make necessary information available to equipment and clothing designers.

PROCEDURE

On the basis of requirements the following ten variables were extracted from the data collected by Gifford et al.: standing height; sitting height; eye height, sitting; shoulder height, sitting; functional reach; bideltoid diameter; thigh circumference; buttock-knee length; knee height, sitting; and head height. Definitions of these morphological features are contained in Appendix A. The relationship between the selected sets of variables (listed as Tables I to XXI in the Table of Contents) was determined by means of computer programs. These programs maintained a frequency count of the number of individuals whose anthropometric features allowed them to fall into a particular cell of the table. The proportion of the total group contained within each cell was then calculated and is presented in Tables I through XXI. Since the original data were converted from centimeters or millimeters to inches for this report, the data presented in these tables contain rounding errors.

DATA UTILIZATION

The ideal 3rd, 50th, and 98th percentile man does not exist. Indeed, due to the relationship between some anthropometric features, it is not uncommon for some individuals whose anthropometric features fall at the 95th percentile on one dimension to fall below the 5th percentile on another dimension. Since the individual who is large (or small) on one dimension is not necessarily large (or small) on all other dimensions, bivariate tables (as a minimum) must be used when workspaces are being designed.

For the purpose of illustration, assume that space requirements at a crewstation are such that restrictions are placed on eye height, sitting (must exceed 29.68 inches) and on buttock-knee length (must exceed 22.56 inches). With these limitations imposed it would be desirable to determine what proportion of the naval aviator population would be eliminated from this crewstation. An examination of Figure 1 (a modified version of Table XIV) reveals that in order to meet the restrictions specified above, individuals below the 5th percentile in both seated eye height and buttock-knee length would be eliminated from the potential crewstation operator population. The exact proportion of the population that would be eliminated can be determined by adding the row and column totals for those rows and columns contained within the specified area (i.e., all values enclosed within the dotted lines in Figure 1) and subtracting from their sum the proportion attributable to those individuals who fell in both the rows and columns. In Figure 1, 5.552 per cent of the sample fell below the 22.56-inch limit or the 5th percentile* buttock-knee length (column total), and 5.164 per cent fell below the 29.68-inch limit or the 5th percentile for seated eye height (row total).

*Because the data are discrete rather than continuous, slightly more or less than the expected proportion of the sample may fall below a given percentile.

BUTTOCK-KNEE LENGTH		EYE HEIGHT, SITTING		EYE HEIGHT, SITTING		EYE HEIGHT, SITTING	
PCTLE	INCHES	PCTLE	INCHES	PCTLE	INCHES	PCTLE	INCHES
99.0+	35.62	—	—	—	—	—	—
99.0	34.50	—	—	—	—	—	—
98.0	34.21	—	—	—	—	—	—
97.0	33.92	—	—	—	—	—	—
95.0	33.58	—	—	—	—	—	—
90.0	33.11	—	—	—	—	—	—
85.0	32.79	—	—	—	—	—	—
80.0	32.55	—	—	—	—	—	—
75.0	32.36	—	—	—	—	—	—
70.0	32.12	—	—	—	—	—	—
65.0	31.96	—	—	—	—	—	—
60.0	31.81	—	—	—	—	—	—
55.0	31.61	—	—	—	—	—	—
50.0	31.49	—	—	—	—	—	—
45.0	31.37	—	—	—	—	—	—
40.0	31.22	—	—	—	—	—	—
35.0	31.06	—	—	—	—	—	—
30.0	30.94	—	—	—	—	—	—
25.0	30.74	—	—	—	—	—	—
20.0	30.59	—	—	—	—	—	—
15.0	30.35	—	—	—	—	—	—
10.0	30.07	—	—	—	—	—	—
5.0	29.68	—	—	—	—	—	—
3.0	29.38	—	—	—	—	—	—
2.0	29.17	—	—	—	—	—	—
1.0	28.77	—	—	—	—	—	—
COL TOTALS	0.968	1.227	0.904	2.453	5.100	0.968	0.904
						1.033	1.0000
ROW TOTALS	—	—	—	—	—	—	—
EYE HEIGHT, SITTING	—	—	—	—	—	—	—
PCTLE	—	—	—	—	—	—	—
INCHES	—	—	—	—	—	—	—

0.968 0.904 1.033 1.0000

for a total of 10.716 per cent. However, eleven entries (enclosed within the reference lines, totaling 0.779 per cent) appear in both the column and row totals. When 0.779 per cent is subtracted from the total 10.716 per cent, the remainder indicates that 9.937 per cent of the aviator population would be eliminated from serving at that crewstation by such restrictions.

Thus, a restriction that effectively excluded all individuals who fell below the 5th percentile on both dimensions eliminated almost 10 per cent of the potential operator population. Due to the slight overlap between the variables ($r = .394$), only 0.779 per cent of the population fell below the 5th percentile on both variables. Whether such a loss could be tolerated or whether changes should be made in the spatial restrictions is, of course, an operational decision. However, by examining Figure 1 (or Table XIV) it can be determined that if the buttock-knee length restriction and the eye height, sitting restriction were reduced by only 0.24 inch and 0.30 inch, respectively, (i.e., both to the 3rd percentile values), only 5.419 per cent of the potential operator population would be eliminated. Judicious use of bivariate tables can reveal appropriate trade-offs.

Most of the terms presented below Tables I - XXI (mean, standard deviation, range, low and high values, and percentile levels) are standard terms; however, the regression equation and the standard error of estimate may require explanation. Regression equations, derived from the correlation between variables, provide a means for predicting the expected value or score of one variable from a knowledge of the value of the other variable. These equations are presented beneath each table. As in most figures, the X-axis is the horizontal factor and the Y-axis is the vertical factor. The standard error of estimate is a measure of the accuracy in predicting Y for a given value of X or X for a

given value of Y. If the standard error of estimate were 1.0 inch, this would mean that upon repeated sampling, two thirds of the time the individual's measurement would fall within plus or minus 1.0 inch of the predicted value. To be able to expect that the individual's measurement would be included between the designated limits 95 per cent of the time, the standard error of estimate should be multiplied by 1.96; for 99 per cent of the time the standard error of estimate should be multiplied by 2.58. A more detailed statement of the procedure is presented in Appendix B.

REQUEST FOR COMMENTS

Appendix C of this report is made available to provide the user with a means for commenting on this report. Your opinions on the tables contained in this report, the presentation, and explanation would be appreciated. Criticisms and recommendations for improvement are also desired.

PROGRAM AVAILABILITY

The programs used in developing the tables presented in this report were prepared by Mrs. Ralph Katona and Mrs. James White and are available to government users from the Data Processing Department, Naval Aerospace Medical Center, Pensacola, Florida 32512, or to non-government users from the Computer Software Management and Information Center, Barrow Hall, University of Georgia, Athens, Georgia 30601.

Table I: Functional Reach Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

FUNCTIONAL REACH PCTLE INCHES		1.0 28.64	2.0 28.86	3.0 29.07	5.0 29.33	10.0 29.72	15.0 30.04	20.0 30.31	25.0 30.51	30.0 30.71	35.0 30.91	40.0 31.02	45.0 31.18	50.0 31.38	55.0 31.54	60.0 31.73	65.0 31.97
SITTING HEIGHT PCTLE INCHES																	
99.0+ 41.33																	0.065
99.0 39.33																	0.129
98.0 38.89																	0.129
97.0 38.66																	0.129
95.0 36.30																	0.129
90.0 37.83	0.065																0.065
85.0 37.51																	0.129
80.0 37.28	0.065																0.129
75.0 37.08																	0.129
70.0 36.91																	0.129
65.0 36.73	0.129																0.129
60.0 36.57		0.065															0.129
55.0 36.45			0.065														0.129
50.0 36.25	0.065	0.065															0.129
45.0 36.10	0.065	0.065															0.129
40.0 35.94	0.065	0.065	0.065														0.129
35.0 35.78				0.129													0.129
30.0 35.62	0.065				0.129												0.129
25.0 35.43						0.129											0.129
20.0 35.27	0.065	0.194	0.065				0.129										0.129
15.0 34.99							0.129										0.129
10.0 34.64								0.129									0.129
5.0 34.21	0.065	0.065						0.129									0.129
3.0 33.97	0.065	0.065	0.129					0.129									0.129
2.0 33.85	0.065							0.129									0.129
1.0 33.46	0.065								0.129								0.129
COL TOTALS	0.968	1.033	0.968	2.582	5.036	4.454	5.875	4.261	5.939	6.133	3.292	4.842	4.842	5.165	4.777	4.842	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STANDARD ERROR	
FUNCTIONAL REACH	31.51	1.421	8.82	27.40	36.22	$y = 25.812 + 0.332y$										SE Y·X =	
SITTING HEIGHT	36.28	1.249	9.02	32.32	41.34	$x = 15.894 + 0.430y$										SE X·Y =	
CORRELATION R = 0.378																	

Table II: Functional Reach Related to Eye Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

FUNCTIONAL REACH PCTLE INCHES		1.0 28.64	2.0 28.86	3.0 29.07	5.0 29.33	10.0 29.72	15.0 30.04	20.0 30.31	25.0 30.51	30.0 30.71	35.0 30.91	40.0 31.02	45.0 31.18	50.0 31.38	55.0 31.54	60.0 31.73	65.0 31.97
EYE HEIGHT, SITTING PCTLE INCHES																	
99.0+ 35.62																	0.065
99.0 34.50																	0.065
98.0 34.21																	0.129
97.0 33.92																	0.065
95.0 33.58																	0.065
90.0 33.11	0.065																0.065
85.0 32.79																	0.065
80.0 32.55																	0.065
75.0 32.36																	0.065
70.0 32.12	0.065	0.065															0.065
65.0 31.96	0.065																0.065
60.0 31.81	0.194																0.065
55.0 31.61																	0.065
50.0 31.49																	0.065
45.0 31.37																	0.065
40.0 31.22																	0.065
35.0 31.06	0.065	0.065	0.129														0.065
30.0 30.94	0.129	0.065	0.065	0.129													0.065
25.0 30.74																	0.065
20.0 30.59	0.129	0.065	0.065	0.065	0.775												0.065
15.0 30.35	0.065	0.194	0.065	0.387	0.258												0.065
10.0 30.07	0.129	0.129	0.065	0.258	0.516												0.065
5.0 29.68																	0.065
3.0 29.38	0.065																0.065
2.0 29.17																	0.065
1.0 28.77	0.065																0.065
COL TOTALS	0.968	1.033	0.968	2.582	5.036	4.454	5.875	4.261	5.939	6.133	3.292	4.842	4.842	5.165	4.777	4.842	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STANDARD ERROR	
FUNCTIONAL REACH	31.51	1.421	8.82	27.40	36.22	$y = 22.122 + 0.300x$										SE Y·X =	
EYE HEIGHT, SITTING	31.57	1.187	7.56	28.07	35.63	$x = 17.927 + 0.430y$										SE X·Y =	
CORRELATION R = 0.359																	

	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	97.0	98.0	99.0	99.0+	ROW TOTALS	EYE HT FT GHT+SITTING
	31.73	31.97	32.20	32.44	32.68	33.03	33.43	34.00	34.45	34.72	35.00	36.22	PTCLE	INCHES
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.033	99.0+ 35.62
0.065	0.065	0.129	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.710	99.0 34.50
0.065	0.129	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.291	98.0 34.21
0.065	0.129	0.065	0.194	0.065	0.323	0.258	0.194	0.194	0.129	0.129	0.129	0.129	1.937	97.0 33.92
0.065	0.129	0.452	0.452	0.387	0.452	0.452	0.387	0.323	0.065	0.065	0.065	0.065	4.713	95.0 33.58
0.065	0.194	0.258	0.581	0.129	0.452	0.194	0.452	0.258	0.065	0.129	0.194	0.194	4.777	90.0 33.11
0.065	0.194	0.258	0.323	0.581	0.387	0.194	0.387	0.581	0.129	0.129	0.065	0.129	5.229	85.0 32.79
0.065	0.258	0.129	0.258	0.323	0.387	0.258	0.452	0.452	0.065	0.065	0.065	0.194	4.648	80.0 32.55
0.065	0.194	0.323	0.387	0.323	0.387	0.258	0.323	0.129	0.065	0.065	0.065	0.065	5.487	75.0 32.36
0.065	0.258	0.258	0.323	0.452	0.194	0.129	0.323	0.258	0.129	0.065	0.129	0.129	4.842	70.0 32.12
0.065	0.258	0.323	0.194	0.258	0.323	0.323	0.258	0.129	0.065	0.065	0.065	0.065	5.165	65.0 31.96
0.065	0.258	0.258	0.194	0.258	0.194	0.516	0.323	0.129	0.065	0.065	0.065	0.065	5.100	60.0 31.81
0.065	0.258	0.258	0.129	0.194	0.516	0.194	0.194	0.129	0.065	0.065	0.065	0.065	4.971	55.0 31.61
0.065	0.258	0.065	0.258	0.129	0.258	0.194	0.258	0.129	0.065	0.065	0.065	0.065	4.648	50.0 31.49
0.065	0.581	0.516	0.258	0.194	0.323	0.129	0.258	0.323	0.194	0.194	0.194	0.194	5.294	45.0 31.37
0.065	0.194	0.258	0.194	0.194	0.194	0.258	0.323	0.129	0.065	0.065	0.065	0.065	4.648	40.0 31.22
0.065	0.323	0.194	0.258	0.194	0.258	0.194	0.194	0.129	0.065	0.065	0.065	0.065	4.584	35.0 31.06
0.065	0.323	0.387	0.258	0.194	0.129	0.387	0.194	0.194	0.065	0.065	0.065	0.065	5.617	30.0 30.94
0.065	0.258	0.258	0.387	0.065	0.258	0.065	0.194	0.065	0.065	0.065	0.065	0.065	5.229	25.0 30.74
0.065	0.323	0.129	0.258	0.194	0.065	0.258	0.065	0.129	0.065	0.065	0.065	0.065	5.036	20.0 30.59
0.065	0.323	0.258	0.129	0.129	0.323	0.065	0.129	0.065	0.065	0.065	0.065	0.065	5.036	15.0 30.35
0.065	0.258	0.065	0.258	0.194	0.129	0.258	0.065	0.129	0.129	0.129	0.129	0.129	4.842	10.0 30.07
0.065	0.129	0.129	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	2.195	5.0 29.68
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.904	3.0 29.38
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.097	2.0 29.17
													0.968	1.0 28.77

STANDARD ERROR OF ESTIMATE		1.0	3.0	PERCENTILE LEVELS				98.0	99.0
				5.0	50.0	95.0			
SE Y·X =	1.107	28.64	29.07	29.33	31.38	34.00	34.72	35.00	
SE X·Y =	1.327	28.78	29.39	29.68	31.50	33.58	34.21	34.51	

Table III: Functional Reach Related to Buttock-Knee Length

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

BUTTOCK-KNEE LGTH PCTLE INCHES	FUNCTIONAL REACH PCTLE INCHES															0.065
	1.0 28.64	2.0 28.86	3.0 29.07	5.0 29.33	10.0 29.72	15.0 30.04	20.0 30.31	25.0 30.51	30.0 30.71	35.0 30.91	40.0 31.02	45.0 31.18	50.0 31.38	55.0 31.54		
99.0+ 27.63																0.065
99.0 26.51																0.065
98.0 26.18																0.065
97.0 26.02																0.065
95.0 25.78																0.065
90.0 25.39																0.065
85.0 25.15																0.065
80.0 24.92																0.065
75.0 24.76																0.065
70.0 24.56																0.065
65.0 24.44																0.065
60.0 24.33																0.065
55.0 24.17																0.065
50.0 24.05																0.065
45.0 23.93																0.065
40.0 23.81																0.065
35.0 23.70																0.065
30.0 23.55																0.065
25.0 23.42																0.065
20.0 23.22																0.065
15.0 23.03																0.065
10.0 22.83																0.065
5.0 22.55																0.065
3.0 22.32																0.065
2.0 22.08																0.065
1.0 21.83																0.065
	COL TOTALS	0.968	1.033	0.968	2.582	5.036	4.454	5.875	4.261	5.939	6.133	3.292	4.842	4.842	5.165	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										
FUNCTIONAL REACH	31.51	1.421	8.82	27.40	36.22	$y = 11.071 + 0.413x$	$x = 11.429 + 0.833y$									
BUTTOCK-KNEE LGTH	24.09	1.001	6.89	20.75	27.64											
CORRELATION R =	0.587															

Table IV: Functional Reach Related to Shoulder Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

SHOULDER HGT, SIT PCTLE INCHES	FUNCTIONAL REACH PCTLE INCHES															0.065
	1.0 28.64	2.0 28.86	3.0 29.07	5.0 29.33	10.0 29.72	15.0 30.04	20.0 30.31	25.0 30.51	30.0 30.71	35.0 30.91	40.0 31.02	45.0 31.18	50.0 31.38	55.0 31.54		
99.0+ 27.36																0.065
99.0 26.37																0.065
98.0 25.94																0.065
97.0 25.85																0.065
95.0 25.47																0.065
90.0 25.11																0.065
85.0 24.88																0.065
80.0 24.68																0.065
75.0 24.52																0.065
70.0 24.37																0.065
65.0 24.21																0.065
60.0 24.09																0.065
55.0 23.93																0.065
50.0 23.77																0.065
45.0 23.66																0.065
40.0 23.54																0.065
35.0 23.38																0.065
30.0 23.18																0.065
25.0 23.07																0.065
20.0 22.87																0.065
15.0 22.64																0.065
10.0 22.40																0.065
5.0 22.04																0.065
3.0 21.81																0.065
2.0 21.69																0.065
1.0 21.47																0.065
	COL TOTALS	0.968	1.033	0.968	2.582	5.036	4.454	5.875	4.261	5.939	6.133	3.292	4.842	4.842	5.165	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										
FUNCTIONAL REACH	31.51	1.421	8.82	27.40	36.22	$y = 17.059 + 0.214x$	$x = 22.435 + 0.381y$									
SHOULDER HGT, SIT	23.79	1.064	7.32	20.04	27.36											
CORRELATION R =	0.285															

B

	50.0 31.38	55.0 31.54	60.0 31.73	65.0 31.97	70.0 32.20	75.0 32.44	80.0 32.68	85.0 33.03	90.0 33.43	95.0 34.00	97.0 34.45	98.0 34.72	99.0 35.00	99.0+ 36.22	ROW TOTALS	BUTTOCK-KNEE LGTH PCTLE INCHES
	0.065	0.065														
5	0.258	0.129	0.129	0.129	0.194	0.065	0.323	0.129	0.129	0.194	0.129	0.323	0.129	0.065	1.033	99.0+ 27.63
5	0.323	0.258	0.129	0.129	0.452	0.258	0.387	0.387	0.452	0.516	0.516	0.258	0.194	0.065	0.904	99.0 26.51
4	0.323	0.194	0.452	0.258	0.452	0.323	0.452	0.516	0.516	0.258	0.194	0.258	0.129	0.194	0.968	98.0 26.18
9	0.194	0.194	0.129	0.323	0.452	0.516	0.516	0.387	0.710	0.516	0.323	0.194	0.129	0.194	1.937	97.0 26.02
9	0.194	0.323	0.323	0.323	0.387	0.387	0.129	0.194	0.387	0.258	0.129	0.065	0.065	0.194	0.036	95.0 25.78
2	0.258	0.323	0.387	0.323	0.581	0.452	0.452	0.387	0.646	0.387	0.194	0.258	0.129	0.065	4.842	90.0 25.39
8	0.258	0.323	0.452	0.387	0.194	0.323	0.452	0.452	0.129	0.129	0.065	0.194	0.129	0.065	5.229	85.0 25.15
6	0.581	0.452	0.194	0.194	0.387	0.194	0.323	0.323	0.258	0.387	0.194	0.258	0.129	0.065	3.938	80.0 24.92
8	0.194	0.323	0.194	0.065	0.387	0.323	0.258	0.323	0.129	0.129	0.129	0.065	0.065	0.194	0.939	75.0 24.76
3	0.258	0.516	0.387	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.065	4.454	70.0 24.56
9	0.323	0.387	0.194	0.516	0.258	0.129	0.194	0.452	0.194	0.323	0.323	0.129	0.129	0.065	5.487	65.0 24.44
8	0.387	0.516	0.387	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.065	6.00	24.33
5	0.129	0.323	0.258	0.129	0.387	0.258	0.129	0.323	0.516	0.323	0.323	0.129	0.129	0.065	5.100	55.0 24.17
5	0.129	0.323	0.258	0.129	0.387	0.258	0.129	0.323	0.516	0.323	0.323	0.129	0.129	0.065	4.906	50.0 24.05
3	0.065	0.323	0.194	0.387	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.065	4.454	45.0 23.93
3	0.258	0.129	0.387	0.452	0.516	0.194	0.194	0.194	0.129	0.129	0.129	0.129	0.129	0.065	5.100	40.0 23.81
3	0.258	0.194	0.258	0.258	0.065	0.323	0.258	0.258	0.129	0.129	0.065	0.065	0.065	0.065	6.262	35.0 23.70
3	0.194	0.065	0.258	0.387	0.258	0.065	0.129	0.129	0.258	0.129	0.129	0.065	0.065	0.065	4.325	30.0 23.55
4	0.194	0.258	0.065	0.065	0.194	0.065	0.129	0.065	0.129	0.129	0.065	0.065	0.065	0.065	5.487	25.0 23.42
3	0.258	0.194	0.129	0.065	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	4.906	20.0 23.22
3	0.194	0.065	0.194	0.129	0.065	0.129	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	4.584	15.0 23.03
5	0.129	0.065	0.129	0.065	0.129	0.065	0.129	0.065	0.129	0.065	0.065	0.065	0.065	0.065	5.100	10.0 22.83
9	0.129														2.453	5.0 22.55
															0.904	3.0 22.32
															1.227	2.0 22.08
															0.968	1.0 21.83

	STANDARD ERROR OF ESTIMATE				1.0	3.0	PERCENTILE LEVELS				5.0	50.0	95.0	98.0	99.0
	SE Y·X =	0.811			28.64	29.07	29.33	31.38	34.00	34.72	35.00				
	SE X·Y =	1.151			21.83	22.32	22.56	24.06	25.79	26.18	26.52				

	50.0 31.38	55.0 31.54	60.0 31.73	65.0 31.97	70.0 32.20	75.0 32.44	80.0 32.68	85.0 33.03	90.0 33.43	95.0 34.00	97.0 34.45	98.0 34.72	99.0 35.00	99.0+ 36.22	ROW TOTALS	SHOULDR HGT, SIT PCTLE INCHES
	0.065	0.129	0.129	0.065	0.065	0.129	0.065	0.129	0.129	0.129	0.065	0.065	0.065	0.065	0.968	99.0+ 27.36
5	0.065	0.258	0.129	0.065	0.129	0.065	0.129	0.065	0.258	0.129	0.065	0.065	0.065	0.065	0.968	99.0 26.37
4	0.194	0.129	0.129	0.194	0.194	0.323	0.194	0.323	0.129	0.129	0.065	0.065	0.065	0.065	1.097	98.0 25.94
3	0.194	0.323	0.065	0.323	0.516	0.387	0.516	0.194	0.194	0.194	0.194	0.194	0.194	0.065	1.937	97.0 25.85
3	0.194	0.387	0.129	0.323	0.581	0.194	0.194	0.387	0.258	0.129	0.129	0.065	0.129	0.129	4.648	95.0 25.47
3	0.323	0.323	0.323	0.452	0.194	0.194	0.194	0.129	0.323	0.129	0.194	0.065	0.065	0.129	4.906	90.0 25.11
3	0.258	0.258	0.194	0.129	0.387	0.323	0.194	0.129	0.646	0.129	0.129	0.065	0.194	0.194	4.777	85.0 24.88
9	0.258	0.194	0.258	1.129	0.516	0.129	0.323	0.387	0.194	0.258	0.194	0.129	0.065	0.194	4.971	80.0 24.68
9	0.387	0.323	0.516	0.323	0.194	0.258	0.194	0.516	0.516	0.387	0.129	0.129	0.065	0.065	4.584	75.0 24.52
9	0.194	0.323	0.387	0.194	0.323	0.194	0.194	0.323	0.194	0.194	0.129	0.129	0.065	0.065	5.875	70.0 24.37
4	0.581	0.646	0.258	0.129	0.258	0.258	0.194	0.065	0.452	0.194	0.129	0.129	0.065	0.065	4.713	65.0 24.21
9	0.387	0.065	0.194	0.516	0.323	0.194	0.387	0.387	0.452	0.129	0.065	0.065	0.065	0.065	5.358	60.0 24.09
3	0.323	0.129	0.129	0.387	0.129	0.258	0.258	0.258	0.194	0.129	0.129	0.065	0.065	0.065	5.100	55.0 23.93
2	0.065	0.194	0.258	0.323	0.387	0.129	0.129	0.258	0.258	0.323	0.129	0.065	0.065	0.065	4.906	50.0 23.77
4	0.065	0.129	0.129	0.646	0.323	0.129	0.258	0.258	0.258	0.323	0.129	0.065	0.065	0.065	4.713	45.0 23.66
3	0.258	0.323	0.194	0.194	0.323	0.194	0.194	0.452	0.194	0.194	0.194	0.194	0.194	0.065	4.519	40.0 23.54
3	0.129	0.258	0.065	0.129	0.387	0.065	0.258	0.323	0.129	0.194	0.194	0.194	0.194	0.065	5.939	35.0 23.38
3	0.387	0.258	0.194	0.194	0.194	0.258	0.194	0.065	0.065	0.129	0.129	0.129	0.129	0.065	4.196	30.0 23.18
4	0.194	0.129	0.129	0.258	0.194	0.194	0.194	0.194	0.194	0.194	0.065	0.065	0.065	0.065	5.552	25.0 23.07
3	0.065	0.323	0.323	0.065	0.129</td											

Table V: Functional Reach Related to Standing Height

A

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

STANDING HEIGHT PCTILE INCHES	FUNCTIONAL REACH PCTILE INCHES																	
	1.0 28.64	2.0 28.86	3.0 29.07	5.0 29.33	10.0 29.72	15.0 30.04	20.0 30.31	25.0 30.51	30.0 30.71	35.0 30.91	40.0 31.02	45.0 31.18	50.0 31.38	55.0 31.54	60.0 31.73	65.0 31.91		
99.0+ 77.12																		0.065
99.0 75.27																		0.065
98.0 74.64																		0.065
97.0 74.40																		0.065
95.0 73.93																		0.065
90.0 73.07	0.065																	0.065
85.0 72.44																		0.065
80.0 71.96																		0.065
75.0 71.53																		0.065
70.0 71.14																		0.065
65.0 70.86																		0.065
60.0 70.54																		0.065
55.0 70.19																		0.065
50.0 69.84																		0.065
45.0 69.52	0.065	0.065																0.065
40.0 69.29		0.065																0.065
35.0 68.93			0.065															0.065
30.0 68.58				0.065														0.065
25.0 68.18					0.065													0.065
20.0 67.87						0.065												0.065
15.0 67.51							0.065											0.065
10.0 66.92								0.065										0.065
5.0 66.19									0.065									0.065
3.0 65.78										0.065								0.065
2.0 65.51											0.065							0.065
1.0 65.09												0.065						0.065
	COL TOTALS	0.968	1.033	0.968	2.582	5.036	4.454	5.875	4.261	5.939	6.133	3.292	4.842	4.842	5.165	4.777	4.84	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS												STANDARD ERROR
FUNCTIONAL REACH	31.51	1.421	8.82	27.40	36.22	$y = 35.118 + 1.105x$											SE Y.X	
STANDING HEIGHT	69.94	2.333	13.62	63.50	77.13	$x = 2.829 + 0.410y$											SE X.Y	
CORRELATION R = 0.673																		

Table VI: Shoulder Height, Sitting, Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

SITTING HEIGHT PCTILE INCHES	SHOULDER HGT, SIT PCTILE INCHES																	
	1.0 21.48	2.0 21.69	3.0 21.81	5.0 22.05	10.0 22.40	15.0 22.65	20.0 22.87	25.0 23.07	30.0 23.19	35.0 23.39	40.0 23.54	45.0 23.66	50.0 23.78	55.0 23.94	60.0 24.09	65.0 24.21		
99.0+ 41.33																		0.065
99.0 39.33																		0.065
98.0 38.89																		0.065
97.0 38.66																		0.065
95.0 38.30																		0.065
90.0 37.83																		0.065
85.0 37.51																		0.065
80.0 37.28																		0.065
75.0 37.08																		0.065
70.0 36.91																		0.065
65.0 36.73																		0.065
60.0 36.57																		0.065
55.0 36.45																		0.065
50.0 36.25	0.065																	0.065
45.0 36.10																		0.065
40.0 35.94																		0.065
35.0 35.78																		0.065
30.0 35.62	0.065	0.065	0.129	0.710	0.452	0.516	0.775	0.387	0.646	0.387	0.194	0.516	0.258	0.387	0.194	0.065	0.065	
25.0 35.43	0.065	0.065	0.065	0.258	0.452	0.452	0.452	0.387	0.194	0.387	0.194	0.387	0.194	0.387	0.194	0.065	0.065	
20.0 35.27	0.065	0.065	0.065	0.710	0.387	1.033	0.710	0.516	0.581	0.452	0.387	0.323	0.258	0.387	0.194	0.065	0.065	
15.0 34.99	0.129	0.258	0.065	0.387	0.968	0.646	0.581	0.387	0.065	0.581	0.387	0.194	0.194	0.065	0.065	0.065	0.065	
10.0 34.64	0.065	0.452	0.194	0.516	0.904	0.516	0.775	0.904	0.258	0.323	0.129	0.323	0.387	0.581	0.194	0.065	0.065	
5.0 34.21	0.065	0.129	0.258	0.323	0.452	0.323	0.129	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	
3.0 33.97	0.194	0.065	0.129	0.194	0.065	0.129	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	
2.0 33.85	0.129	0.065	0.129	0.129	0.194	0.129	0.194	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	
1.0 33.46	0.258	0.194	0.194	0.194	0.258	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	
	COL TOTALS	0.968	1.291	0.839	2.260	5.423	4.196	5.294	5.552	4.196	5.939	4.519	4.713	4.906	5.100	5.358	4.713	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS												STANDARD ERROR
SHOULDER HGT, SIT	23.79	1.064	7.32	20.04	27.36	$y = 14.235 + 0.926x$											SE Y.X	
SITTING HEIGHT	36.28	1.249	9.02	32.32	41.34	$x = -0.621 + 0.673y$											SE X.Y	
CORRELATION R = 0.790																		

	55.0 23.94	60.0 24.09	65.0 24.21	70.0 24.37	75.0 24.53	80.0 24.68	85.0 24.88	90.0 25.12	95.0 25.47	97.0 25.85	98.0 25.94	99.0 26.38	99.0+ 27.36	ROW TOTALS	SITTING HEIGHT PCTILE INCHES
18															99.0+ 41.33
															99.0 39.33
															99.0 38.89
															98.0 38.66
															97.0 38.30
															95.0 37.80
															85.0 37.51
															80.0 37.28
															75.0 37.08
															70.0 36.91
															65.0 36.73
															60.0 36.57
															55.0 36.45
															50.0 36.25
															45.0 36.10
															40.0 35.94
															35.0 35.78
															30.0 35.62
															25.0 35.43
															20.0 35.27
															15.0 34.99
															10.0 34.64
															5.0 34.21
															3.0 33.97
															2.0 33.85
															1.0 33.46
14	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	5.036	15.0 34.99
	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	5.100	10.0 34.64
														2.066	5.0 34.21
														0.904	3.0 33.97
														1.033	2.0 33.85
														1.097	1.0 33.46

	STANDARD ERROR OF ESTIMATE	1.0	3.0	PERCENTILE LEVELS					
				5.0	50.0	95.0	98.0	99.0	
	SE Y.X =	0.766	21.48	21.81	22.05	23.78	25.47	25.94	26.38
	SE X.Y =	0.653	33.46	33.98	34.21	36.26	38.31	38.90	39.33

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Table VII: Shoulder Height, Sitting, Related to Eye Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

SHOULDER HGT, SIT																
PCTLE	1.0	2.0	3.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	
INCHES	21.48	21.69	21.81	22.05	22.40	22.65	22.87	23.07	23.19	23.39	23.54	23.66	23.78	23.94	24.00	
EYE HEIGHT, SITTING																
PCTLE	1.0	2.0	3.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	
INCHES	21.48	21.69	21.81	22.05	22.40	22.65	22.87	23.07	23.19	23.39	23.54	23.66	23.78	23.94	24.00	
99.0+	35.62															0.065
99.0	34.50															0.0
98.0	34.21															
97.0	33.92															
95.0	33.58															
90.0	33.11															
85.0	32.79															
80.0	32.55															
75.0	32.36															
70.0	32.12															
65.0	31.96															
60.0	31.81															
55.0	31.61															
50.0	31.49															
45.0	31.37															
40.0	31.22															
35.0	31.06															
30.0	30.94															
25.0	30.74															
20.0	30.59															
15.0	30.35															
10.0	30.07															
5.0	29.68															
3.0	29.38															
2.0	29.17															
1.0	28.77															
COL TOTALS	0.968	1.291	0.839	2.260	5.423	4.196	5.294	5.552	4.196	5.939	4.519	4.713	4.906	5.100	5.3	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STAN
SHOULDER HGT, SIT	23.79	1.064	7.32	20.04	27.36	$Y = 10.635 + 0.880X$	$X = 1.449 + 0.708Y$									
EYE HEIGHT, SITTING	31.57	1.187	7.56	28.07	35.63											
CORRELATION R	= 0.789															

Table VIII: Shoulder Height, Sitting, Related to Knee Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

SHOULDER HGT, SIT																
PCTLE	1.0	2.0	3.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	
INCHES	21.48	21.69	21.81	22.05	22.40	22.65	22.87	23.07	23.19	23.39	23.54	23.66	23.78	23.94	24.00	
KNEE HEIGHT																
PCTLE	1.0	2.0	3.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	
INCHES	21.48	21.69	21.81	22.05	22.40	22.65	22.87	23.07	23.19	23.39	23.54	23.66	23.78	23.94	24.00	
99.0+	25.07															0.06
99.0	24.17															
98.0	23.89															
97.0	23.70															
95.0	23.50															
90.0	23.14															
85.0	22.83															
80.0	22.67															
75.0	22.51															
70.0	22.38															
65.0	22.24															
60.0	22.08															
55.0	21.96															
50.0	21.81															
45.0	21.69															
40.0	21.57															
35.0	21.41															
30.0	21.29															
25.0	21.18															
20.0	20.98															
15.0	20.82															
10.0	20.59															
5.0	20.31															
3.0	20.07															
2.0	19.88															
1.0	19.72															
COL TOTALS	0.968	1.291	0.839	2.260	5.423	4.196	5.294	5.552	4.196	5.939	4.519	4.713	4.906	5.100	5.35	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STAND
SHOULDER HGT, SIT	23.79	1.064	7.32	20.04	27.36	$Y = 11.837 + 0.421X$	$X = 12.917 + 0.498Y$									
KNEE HEIGHT	21.84	0.978	6.06	19.02	25.08											
CORRELATION R	= 0.45P															

2

'13 4.906 5.100 5.358 4.713 5.875 4.584 4.971 4.777 4.906 4.648 1.937 1.097 0.968 0.968 100.000

STANDARD ERROR OF ESTIMATE	1.0	3.0	PERCENTILE LEVELS				98.0	99.0
			5.0	50.0	95.0			
SE Y·X = 0.729	21.48	21.81	22.05	23.78	25.47	25.94	26.38	
SE X·Y = 0.654	28.78	29.39	29.68	31.50	33.58	34.21	34.51	

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	STANDARD ERROR OF ESTIMATE	1.0	3.0	PERCENTILE LEVELS				
				5.0	50.0	95.0	98.0	99.0
SE Y.X =	0.870	21.48	21.81	22.05	23.78	25.47	25.94	26.38
SE X.Y =	0.946	19.72	20.08	20.31	21.81	23.5	23.90	24.17

Table IX: Bideltoid Diameter Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

		BIDELTOID DIAMETER																			
SITTING HEIGHT	PCTILE INCHES	1.0 16.57	2.0 16.93	3.0 17.13	5.0 17.28	10.0 17.60	15.0 17.83	20.0 17.99	25.0 18.19	30.0 18.31	35.0 18.46	40.0 18.58	45.0 18.66	50.0 18.78	55.0 18.90	60.0 18.98	65.0 19.0				
99.0+	41.33																				
99.0	39.33																				
98.0	38.89																				
97.0	38.66																				
95.0	38.30																				
90.0	37.83	0.065	0.065	0.129																	
85.0	37.51				0.065	0.065	0.129	0.194	0.129	0.194	0.065	0.194	0.323	0.194	0.065	0.258	0.194				
80.0	37.28					0.065	0.065	0.194	0.129	0.323	0.452	0.065	0.258	0.065	0.323	0.452	0.065	0.323			
75.0	37.08						0.065	0.194	0.194	0.065	0.323	0.258	0.387	0.194	0.194	0.129	0.646	0.194	0.387		
70.0	36.91							0.129	0.065	0.194	0.387	0.323	0.258	0.387	0.258	0.323	0.387	0.194	0.387		
65.0	36.73								0.129	0.065	0.194	0.387	0.646	0.194	0.323	0.065	0.194	0.258	0.065	0.387	
60.0	36.57									0.129	0.065	0.194	0.387	0.646	0.194	0.323	0.065	0.258	0.065	0.387	
55.0	36.45										0.194	0.387	0.323	0.258	0.387	0.258	0.323	0.387	0.129	0.387	
50.0	36.25										0.129	0.065	0.194	0.387	0.323	0.258	0.387	0.129	0.258	0.129	
45.0	36.10											0.129	0.065	0.194	0.387	0.323	0.258	0.387	0.194	0.065	
40.0	35.94											0.129	0.065	0.194	0.387	0.323	0.258	0.387	0.194	0.258	
35.0	35.78											0.129	0.065	0.258	0.129	0.387	0.323	0.258	0.387	0.194	0.258
30.0	35.62												0.129	0.129	0.387	0.710	0.065	0.194	0.323	0.452	0.323
25.0	35.43													0.129	0.065	0.194	0.387	0.323	0.129	0.194	0.065
20.0	35.27														0.129	0.065	0.194	0.387	0.323	0.194	0.387
15.0	34.99															0.129	0.194	0.387	0.323	0.194	0.387
10.0	34.64																0.129	0.194	0.387	0.323	0.194
5.0	34.21																	0.129	0.194	0.387	0.323
3.0	33.97																		0.129	0.194	0.387
2.0	33.85																			0.129	0.194
1.0	33.46																				0.129
		COL TOTALS	1.097	0.839	1.549	1.679	4.842	5.100	4.906	6.520	4.196	5.358	5.229	4.003	5.229	5.875	3.551	5.036			
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STANDARD ERROR					
EIDELTOID DIAMETER	18.78	0.908	6.81	14.84	21.65	Y = 29.590 + 0.356X	X = 11.955 + 0.188Y									SE Y·X =					
SITTING HEIGHT	36.28	1.249	9.02	32.32	41.34											SE X·Y =					
CORRELATION R = 0.259																					

Table X: Eye Height, Sitting, Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

		EYE HEIGHT, SITTING																	
SITTING HEIGHT	PCTILE INCHES	1.0 28.78	2.0 29.17	3.0 29.39	5.0 29.68	10.0 30.08	15.0 30.35	20.0 30.59	25.0 30.75	30.0 30.94	35.0 31.06	40.0 31.22	45.0 31.38	50.0 31.50	55.0 31.61	60.0 31.81	65.0 31.97		
99.0+	41.33																		
99.0	39.33																		
98.0	38.89																		
97.0	38.66																		
95.0	38.30																		
90.0	37.83																		
85.0	37.51																		
80.0	37.28																		
75.0	37.08																		
70.0	36.91																		
65.0	36.73																		
60.0	36.57																		
55.0	36.45																		
50.0	36.25																		
45.0	36.10																		
40.0	35.94																		
35.0	35.78																		
30.0	35.62																		
25.0	35.43																		
20.0	35.27																		
15.0	34.99																		
10.0	34.64																		
5.0	34.21																		
3.0	33.97																		
2.0	33.85																		
1.0	33.46																		
		COL TOTALS	0.968	1.097	0.904	2.195	4.842	5.036	5.036	5.229	5.617	4.584	4.648	5.294	4.648	4.971	5.100	5.165	
MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS										STANDARD ERROR			
EYE HEIGHT, SITTING	31.57	1.187	7.56	28.07	35.63	Y = 5.583 + 0.972X	X = -0.282 + 0.878Y									SE Y·X =			
SITTING HEIGHT	36.28	1.249	9.02	32.32	41.34											SE X·Y =			
CORRELATION R = 0.924																			

	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	97.0	98.0	99.0	99.0+		ROW TOTALS	SITTING	H.FIGHT
0	31.61	31.81	31.97	32.13	32.36	32.56	32.80	33.11	33.58	33.92	34.21	34.51	35.63		PCTLE	INCHES	
															99.0+	41.33	
															99.0	39.33	
															98.0	38.89	
															97.0	38.66	
															95.0	38.30	
															90.0	37.83	
															85.0	37.51	
															80.0	37.28	
															75.0	37.08	
															70.0	36.91	
															65.0	36.73	
															55.0	36.45	
															50.0	36.25	
															45.0	36.10	
															40.0	35.94	
															35.0	35.78	
															30.0	35.62	
															25.0	35.43	
															20.0	35.27	
															15.0	34.99	
															10.0	34.64	
															5.0	34.21	
															3.0	33.97	
															2.0	33.85	
															1.0	33.46	

Table XI: Head Height Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

HEAD HEIGHT PCTLE INCHES		1.0 4.49	2.0 4.61	3.0 4.69	5.0 4.72	10.0 4.84	15.0 4.92	20.0 4.96	25.0 5.00	30.0 5.04	40.0 5.10	45.0 5.12	50.0 5.16	55.0 5.20	60. 5.			
SITTING HEIGHT PCTLE INCHES																		
99.0+	41.33	0.065							0.129		0.129				0.065			
99.0	39.33					0.065		0.065	0.065		0.129				0.129			
98.0	38.89						0.065	0.065	0.065						0.129			
97.0	38.66						0.129	0.129	0.129						0.194			
95.0	38.30						0.129	0.129	0.129						0.194			
90.0	37.83	0.065				0.129	0.129	0.129	0.129	0.323	0.581	0.129	0.129	0.367	0.3			
85.0	37.51		0.129			0.129	0.194	0.452	0.323	0.258	0.194	0.581	0.129	0.194	0.258	0.1		
80.0	37.28	0.065	0.065		0.129	0.129	0.129	0.129	0.194	0.258	0.258	0.323	0.452	0.194	0.516	0.1		
75.0	37.08			0.065	0.194	0.194	0.194	0.258	0.323	0.065	0.258	0.323	0.387	0.323	0.581	0.3		
70.0	36.91				0.129	0.065	0.258	0.065	0.194	0.323	0.258	0.452	0.323	0.194	0.194	0.3		
65.0	36.73					0.129	0.194	0.452	0.129	0.194	0.129	0.581	0.387	0.129	0.646	0.3		
60.0	36.57						0.065	0.387	0.129	0.323	0.194	0.323	0.258	0.129	0.194	0.2		
55.0	36.45						0.065	0.258	0.387	0.323	0.323	0.516	0.323	0.258	0.194	0.2		
50.0	36.25	0.065		0.129	0.065	0.194	0.258	0.387	0.258	0.065	0.194	0.129	0.452	0.3				
45.0	36.10		0.065	0.065		0.516	0.710	0.129	0.452	0.065	0.387	0.258	0.258	0.258	0.2			
40.0	35.94	0.065	0.194			0.194	0.323	0.065	0.194	0.367	0.387	0.323	0.258	0.581	0.3			
35.0	35.78					0.129	0.065	0.323	0.452	0.129	0.258	0.129	0.516	0.323	0.258	0.3		
30.0	35.62	0.065				0.129	0.065	0.387	0.646	0.581	0.452	0.516	0.387	0.655	0.387	0.1		
25.0	35.43	0.129					0.258	0.387	0.194	0.129	0.323	0.581	0.258	0.323	0.258	0.2		
20.0	35.27	0.129				0.323	0.065	0.323	0.452	0.065	0.258	0.129	0.646	0.323	0.387	0.516	0.3	
15.0	34.99	0.194				0.194	0.129	0.387	0.516	0.194	0.387	0.258	0.387	0.323	0.452	0.258	0.1	
10.0	34.64			0.065	0.129	0.775	0.581	0.258	0.323	0.194	0.258	0.323	0.323	0.258	0.4			
5.0	34.21	0.065	0.065	0.065	0.194	0.065	0.065	0.065	0.065	0.258	0.323	0.129	0.258	0.323	0.4			
3.0	33.97	0.129				0.129	0.065			0.129	0.194	0.129	0.194	0.065	0.194			
2.0	33.85	0.129				0.129				0.129		0.194	0.065	0.194	0.065			
1.0	33.46	0.065					0.065	0.258	0.129	0.065	0.129	0.065	0.129	0.065	0.065			
COL TOTALS		1.485	0.516	2.066	1.227	5.617	6.908	4.132	5.165	4.906	8.586	5.939	5.100	7.101	5.5			
MEASUREMENTS		MEAN			STANDARD DEVIATION	RANGE	LOW	HIGH			REGRESSION EQUATIONS					STANDARD E		
HEAD HEIGHT		5.16			0.254	1.85	4.21	6.06	Y =	30.244 + 1.169X					SE Y.			
SITTING HEIGHT		36.28			1.249	9.02	32.32	41.34	X =	3.412 + 0.048Y					SE X.			
CORRELATION R =	0.237																	

Table XII: Head Height Related to Eye Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

HEAD HEIGHT PCTLE INCHES		1.0 4.49	2.0 4.61	3.0 4.69	5.0 4.72	10.0 4.84	15.0 4.92	20.0 4.96	25.0 5.00	30.0 5.04	40.0 5.10	45.0 5.12	50.0 5.16	55.0 5.20	60. 5.				
EYE HEIGHT,SITTING PCTLE INCHES																			
99.0+	35.62								0.065		0.194	0.065			0.11				
99.0	34.50								0.065	0.065	0.129	0.065	0.065	0.065	0.11				
98.0	34.21	0.065				0.129	0.065		0.065	0.065	0.065	0.129	0.065	0.065					
97.0	33.92						0.129	0.194	0.065	0.129	0.065	0.194	0.129	0.065					
95.0	33.58						0.129	0.065	0.194	0.129	0.065	0.323	0.194	0.387	0.581	0.3			
90.0	33.11		0.194		0.065	0.129	0.129	0.129	0.258	0.129	0.452	0.516	0.323	0.258	0.323	0.0			
85.0	32.79	0.129	0.065	0.065	0.258	0.194	0.323	0.323	0.194	0.194	0.387	0.258	0.194	0.452	0.0				
80.0	32.55	0.065			0.129	0.129	0.323	0.065	0.258	0.258	0.194	0.452	0.194	0.581	0.1				
75.0	32.36	0.065	0.065	0.065	0.129	0.581	0.323	0.194	0.258	0.387	0.452	0.194	0.323	0.2					
70.0	32.12	0.129	0.065	0.065	0.194	0.387	0.194	0.194	0.452	0.646	0.194	0.655	0.387	0.3					
65.0	31.96	0.129	0.065	0.129	0.194	0.387	0.065	0.646	0.194	0.129	0.258	0.323	0.194	0.3					
60.0	31.81		0.065			0.323	0.194	0.387	0.387	0.258	0.323	0.516	0.129	0.129	0.3				
55.0	31.61	0.065	0.065		0.194	0.516	0.194	0.258	0.129	0.452	0.387	0.452	0.581	0.1					
50.0	31.49	0.065			0.258	0.129	0.516	0.129	0.258	0.065	0.258	0.129	0.194	0.3					
45.0	31.37	0.065				0.516	0.387	0.129	0.129	0.065	0.452	0.387	0.323	0.387	0.2				
40.0	31.22	0.065					0.129	0.258	0.194	0.129	0.452	0.323	0.194	0.258	0.516	0.4			
35.0	31.06	0.065	0.065	0.065	0.129	0.323	0.323	0.323	0.258	0.581	0.323	0.065	0.387	0.065	0.387	0.1			
30.0	30.94					0.065	0.065	0.387	0.452	0.194	0.452	0.129	0.452	0.516	0.452	0.323	0.1		
25.0	30.74	0.129			0.194	0.194	0.452	0.258	0.387	0.258	0.387	0.194	0.452	0.710	0.3				
20.0	30.59	0.194					0.452	0.387	0.065	0.258	0.194	0.516	0.258	0.323	0.258	0.3			
15.0	30.35				0.194	0.129	0.516	0.387	0.387	0.452	0.258	0.646	0.258	0.194	0.129	0.2			
10.0	30.07	0.129	0.065	0.065	0.387	0.452	0.194	0.194	0.452	0.452	0.194	0.452	0.194	0.258	0.194	0.387	0.1		
5.0	29.68	0.065			0.323	0.194	0.065	0.065	0.065	0.258	0.323	0.194	0.258	0.194	0.065	0.065	0.0		
3.0	29.58	0.065				0.194	0.129	0.065		0.065	0.194	0.065	0.065	0.					

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SITTING HEIGHT															ROW TOTALS	PCTLE	INCHES
45.0 5.12	50.0 5.16	55.0 5.20	60.0 5.24	70.0 5.28	75.0 5.31	80.0 5.35	85.0 5.39	90.0 5.47	95.0 5.57	97.0 5.63	98.0 5.67	99.0 5.77	99.0+ 6.06				
0.065	0.129	0.194	0.129	0.129	0.129	0.129	0.065	0.129	0.065	0.129	0.065	0.129	0.065	0.129	1.033	99.0+	41.33
0.065	0.129	0.065	0.258	0.129	0.129	0.065	0.065	0.129	0.129	0.065	0.065	0.129	0.065	0.065	0.968	99.0	39.33
0.065	0.129	0.194	0.129	0.129	0.065	0.065	0.065	0.323	0.065	0.129	0.065	0.129	0.065	0.065	0.968	98.0	38.89
0.646	0.194	0.258	0.194	0.452	0.258	0.387	0.323	0.387	0.323	0.323	0.194	0.129	0.129	0.129	1.743	97.0	38.66
0.129	0.129	0.387	0.323	0.516	0.065	0.323	0.194	0.452	0.194	0.323	0.065	0.065	0.065	0.129	5.165	95.0	38.30
0.129	0.387	0.194	0.065	0.323	0.258	0.258	0.258	1.033	0.065	0.065	0.065	0.065	0.065	0.065	4.648	90.0	37.83
0.452	0.194	0.516	0.194	0.452	0.258	0.323	0.323	0.323	0.129	0.065	0.065	0.065	0.065	0.065	5.358	85.0	37.51
0.387	0.323	0.581	0.316	0.323	0.129	0.323	0.323	0.323	0.194	0.129	0.129	0.129	0.129	0.129	4.777	80.0	37.28
0.323	0.194	0.194	0.387	0.387	0.516	0.129	0.194	0.258	0.065	0.065	0.065	0.065	0.065	0.065	5.423	75.0	37.08
0.387	0.129	0.646	0.323	0.323	0.194	0.323	0.194	0.258	0.387	0.194	0.194	0.194	0.194	0.194	4.648	70.0	36.91
0.258	0.129	0.194	0.258	0.194	0.129	0.129	0.452	0.258	0.323	0.194	0.194	0.194	0.194	0.194	5.165	65.0	36.73
0.323	0.258	0.194	0.258	0.387	0.516	0.129	0.194	0.258	0.258	0.258	0.129	0.065	0.065	0.065	4.196	60.0	36.57
0.194	0.129	0.452	0.387	0.258	0.581	0.194	0.387	0.387	0.194	0.129	0.129	0.129	0.129	0.129	5.229	55.0	36.45
0.258	0.258	0.258	0.258	0.646	0.194	0.323	0.065	0.258	0.129	0.065	0.129	0.129	0.129	0.129	5.165	50.0	36.25
0.323	0.258	0.581	0.323	0.129	0.323	0.323	0.065	0.452	0.258	0.258	0.129	0.129	0.129	0.129	5.229	45.0	36.10
0.323	0.194	0.258	0.323	0.129	0.065	0.065	0.323	0.258	0.258	0.258	0.258	0.129	0.129	0.129	4.971	40.0	35.94
0.258	0.065	0.387	0.194	0.516	0.452	0.129	0.194	0.194	0.065	0.065	0.065	0.065	0.065	0.065	4.519	35.0	35.78
0.258	0.323	0.258	0.258	0.129	0.194	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	5.746	30.0	35.62
0.323	0.323	0.258	0.258	0.129	0.194	0.129	0.129	0.323	0.065	0.129	0.065	0.129	0.065	0.129	4.196	25.0	35.43
0.323	0.387	0.516	0.323	0.516	0.323	0.129	0.129	0.258	0.129	0.129	0.129	0.129	0.129	0.129	5.617	20.0	35.27
0.323	0.452	0.258	0.129	0.452	0.129	0.129	0.194	0.129	0.194	0.129	0.129	0.129	0.129	0.129	5.036	15.0	34.99
0.323	0.323	0.516	0.452	0.129	0.129	0.129	0.065	0.129	0.065	0.065	0.065	0.129	0.129	0.129	5.100	10.0	34.64
0.129	0.258	0.065	0.129	0.258	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	2.066	5.0	34.21
0.065	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.904	3.0	33.97
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.033	2.0	33.85
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.097	1.0	33.46

5.939 **5.100** **7.101** **5.552** **6.843** **5.358** **4.648** **4.132** **6.456** **3.228** **2.518** **0.839** **0.646** **1.033** **100.000**

ONS	STANDARD ERROR OF ESTIMATE	PERCENTILE LEVELS						98.0	99.0
		1.0	3.0	5.0	50.0	95.0			
-169X	SE Y·X = 1.213	4.49	4.69	4.72	5.16	5.57	5.67	5.77	
-048Y	SE X·Y = 0.246	33.46	33.98	34.21	36.26	38.31	38.90	39.33	

45.0 5.12	50.0 5.16	55.0 5.20	60.0 5.24	70.0 5.28	75.0 5.31	80.0 5.35	85.0 5.39	90.0 5.47	95.0 5.57	97.0 5.63	98.0 5.67	99.0 5.77	99.0+ 6.06	ROW TOTALS	EYE HEIGHT, SITTING PCTLE INCHES
0.065		0.129	0.129	0.065	0.129	0.065	0.129	0.065	0.129	0.065	0.129	0.065	0.129	1.033	99.0+ 35.62
0.129	0.065	0.065	0.129	0.065	0.258	0.065	0.065	0.065	0.194	0.065	0.065	0.065	0.065	0.710	99.0 34.50
0.129	0.065	0.065	0.065	0.194	0.258	0.065	0.065	0.065	0.258	0.129	0.065	0.065	0.065	1.291	98.0 34.21
0.194	0.387	0.581	0.323	0.581	0.258	0.323	0.194	0.323	0.065	0.129	0.129	0.065	0.065	1.937	97.0 33.92
0.323	0.258	0.323	0.065	0.258	0.194	0.323	0.258	0.452	0.194	0.258	0.065	0.194	0.194	4.713	95.0 33.58
0.258	0.194	0.452	0.581	0.452	0.258	0.258	0.194	0.194	0.194	0.129	0.129	0.065	0.129	4.777	90.0 33.11
0.194	0.194	0.581	0.129	0.258	0.258	0.129	0.258	0.323	0.194	0.065	0.065	0.065	0.129	5.229	85.0 32.79
0.452	0.194	0.323	0.258	0.258	0.323	0.194	0.452	0.581	0.065	0.194	0.129	0.129	0.129	4.648	80.0 32.55
0.194	0.065	0.387	0.387	0.387	0.129	0.194	0.065	0.452	0.065	0.194	0.194	0.129	0.129	5.487	75.0 32.36
0.258	0.323	0.194	0.387	0.452	0.194	0.581	0.323	0.194	0.258	0.129	0.129	0.129	0.129	4.842	70.0 32.12
0.516	0.129	0.129	0.323	0.323	0.387	0.323	0.065	0.258	0.387	0.129	0.129	0.129	0.129	5.165	65.0 31.96
0.387	0.452	0.581	0.129	0.258	0.194	0.129	0.129	0.516	0.129	0.129	0.065	0.065	0.100	60.0 31.81	
0.258	0.129	0.194	0.323	0.258	0.387	0.258	0.323	0.387	0.258	0.194	0.065	0.065	0.065	4.971	55.0 31.61
0.387	0.323	0.387	0.258	0.129	0.646	0.323	0.129	0.323	0.194	0.129	0.129	0.065	0.065	4.648	50.0 31.49
0.194	0.258	0.516	0.452	0.387	0.129	0.258	0.323	0.129	0.129	0.194	0.194	0.065	0.194	5.294	45.0 31.37
0.323	0.065	0.387	0.194	0.065	0.129	0.258	0.387	0.194	0.323	0.129	0.194	0.065	0.065	4.648	40.0 31.22
0.516	0.452	0.323	0.194	0.581	0.323	0.194	0.194	0.323	0.129	0.194	0.194	0.065	0.065	4.584	35.0 31.06
0.194	0.452	0.710	0.323	0.452	0.129	0.065	0.129	0.258	0.065	0.129	0.194	0.065	0.065	5.617	30.0 30.94
0.258	0.323	0.258	0.323	0.258	0.387	0.129	0.065	0.452	0.065	0.129	0.129	0.065	0.065	5.229	25.0 30.71
0.258	0.194	0.129	0.258	0.323	0.129	0.194	0.065	0.194	0.065	0.194	0.194	0.065	0.065	5.036	20.0 30.59
0.258	0.194	0.387	0.194	0.516	0.323	0.065	0.387	0.065	0.129	0.065	0.065	0.129	0.129	4.842	15.0 30.35
0.194	0.065	0.065	0.065	0.129	0.065	0.065	0.065	0.194	0.194	0.194	0.194	0.194	0.194	2.195	10.0 30.07
0.129	0.065	0.065	0.065	0.129	0.129	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.904	5.0 29.68
0.065		0.065	0.065	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.097	3.0 29.38
0.129	0.065	0.065	0.065	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.968	2.0 29.17
														1.0	24.77

5.939 **5.100** **7.101** **5.552** **6.843** **5.358** **4.648** **4.132** **6.456** **3.228** **2.518** **0.839** **0.646** **1.033** **100.000**

NS	STANDARD ERROR OF ESTIMATE		1.0		3.0		PERCENTILE LEVELS			
							5.0	50.0	95.0	98.0
681X	SE Y.X =	1.174		4.49	4.69	4.72	5.16	5.57	5.67	5.77
031Y	SE X.Y =	0.251		28.78	29.39	29.68	31.50	33.58	34.21	34.51

Table XIII: Buttock-Knee Length Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

Table XIV: Buttock-Knee Length Related to Eye Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

B

	55.0 24.17	60.0 24.33	65.0 24.45	70.0 24.57	75.0 24.76	80.0 24.92	85.0 25.16	90.0 25.39	95.0 25.79	97.0 26.02	98.0 26.18	99.0 26.52	99.0+ 27.64	ROW TOTALS	SITTING HEIGHT PCTILE INCHES
0.194														1.033	99.0+ 41.33
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.968	99.0 34.33	
0.129														0.968	98.0 34.89
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.743	97.0 34.66	
0.387	0.129	0.258	0.258	0.452	0.323	0.387	0.323	0.546	0.452	0.129	0.129	0.129	0.129	5.165	95.0 34.30
0.258	0.129	0.323	0.258	0.516	0.258	0.387	0.452	0.258	0.065	0.129	0.065	0.065	0.065	4.648	90.0 37.83
0.129	0.323	0.258	0.258	0.129	0.258	0.561	0.581	0.387	0.065	0.129	0.065	0.129	0.194	5.358	85.0 37.51
0.258	0.258	0.194	0.258	0.258	0.129	0.323	0.194	0.452	0.258	0.065	0.129	0.129	0.129	4.777	80.0 37.28
0.258	0.194	0.258	0.194	0.323	0.129	0.581	0.323	0.452	0.258	0.065	0.129	0.065	0.065	5.423	75.0 37.08
0.065	0.323	0.387	0.129	0.323	0.387	0.581	0.129	0.452	0.129	0.129	0.129	0.129	0.129	4.648	70.0 36.91
0.065	0.194	0.452	0.387	0.581	0.323	0.129	0.194	0.258	0.194	0.065	0.129	0.129	0.129	5.165	65.0 36.73
0.258	0.452	0.387	0.129	0.194	0.387	0.258	0.065	0.065	0.065	0.065	0.065	0.065	0.196	60.0 36.57	
0.323	0.258	0.129	0.516	0.323	0.258	0.258	0.323	0.194	0.194	0.194	0.194	0.194	0.065	5.229	55.0 36.45
0.387	0.129	0.387	0.129	0.323	0.129	0.258	0.129	0.129	0.129	0.129	0.129	0.129	0.129	5.165	50.0 36.25
0.258	0.194	0.387	0.258	0.646	0.065	0.323	0.194	0.065	0.129	0.129	0.129	0.129	0.129	5.229	45.0 36.10
0.501	0.129	0.194	0.452	0.194	0.194	0.194	0.194	0.194	0.129	0.129	0.129	0.129	0.129	4.971	40.0 35.94
0.129	0.258	0.258	0.129	0.065	0.129	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	4.519	35.0 35.78
0.387	0.129	0.323	0.258	0.646	0.065	0.258	0.194	0.129	0.129	0.129	0.129	0.129	0.129	5.746	30.0 35.62
0.129	0.065	0.258	0.129	0.129	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	4.196	25.0 35.43
0.194	0.323	0.129	0.194	0.129	0.065	0.129	0.194	0.194	0.065	0.065	0.065	0.065	0.065	5.617	20.0 35.27
0.129	0.258	0.323	0.065	0.258	0.258	0.065	0.323	0.129	0.065	0.065	0.065	0.065	0.065	5.036	15.0 34.99
0.065	0.387	0.194	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	5.100	10.0 34.64
0.258	0.129													2.066	5.0 34.23
														0.904	3.0 33.97
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.033	2.0 33.85
0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	1.097	1.0 33.46

	5.100	4.454	5.487	4.454	5.939	3.938	5.229	4.842	5.036	1.937	0.968	0.904	1.033	100.000
STANDARD ERROR OF ESTIMATE														
SE Y·X =	1.153						21.83	22.32	22.56	24.06	25.79	26.18	26.52	
SE X·Y =	0.924						33.46	33.98	34.21	36.26	38.31	38.90	39.33	

	55.0 24.17	60.0 24.33	65.0 24.45	70.0 24.57	75.0 24.76	80.0 24.92	85.0 25.16	90.0 25.39	95.0 25.79	97.0 26.02	98.0 26.18	99.0 26.52	99.0+ 27.64	ROW TOTALS	EYE HEIGHT+SITTING PCTILE INCHES
0.194														1.033	99.0+ 35.62
0.194	0.129													0.710	99.0 34.50
0.065	0.323	0.065	0.065	0.129	0.258	0.194	0.452	0.065	0.129	0.129	0.129	0.129	0.129	1.291	98.0 34.21
0.194	0.065	0.258	0.129	0.129	0.323	0.516	0.516	0.452	0.387	0.129	0.065	0.129	0.129	1.937	97.0 33.92
0.323	0.065	0.452	0.194	0.129	0.258	0.452	0.646	0.516	0.516	0.065	0.129	0.065	0.129	4.713	95.0 33.58
0.129	0.258	0.194	0.194	0.581	0.258	0.387	0.323	0.258	0.065	0.065	0.194	0.194	0.194	4.777	90.0 33.11
0.194	0.581	0.387	0.129	0.387	0.129	0.452	0.194	0.452	0.129	0.065	0.065	0.065	0.065	5.229	85.0 32.79
0.323	0.387	0.323	0.194	0.452	0.258	0.323	0.258	0.258	0.194	0.065	0.065	0.065	0.065	4.648	80.0 32.55
0.194	0.323	0.323	0.258	0.452	0.581	0.323	0.323	0.323	0.323	0.065	0.065	0.065	0.065	5.487	75.0 32.36
0.194	0.258	0.065	0.581	0.194	0.129	0.258	0.258	0.258	0.258	0.129	0.129	0.129	0.129	4.842	70.0 32.12
0.129	0.258	0.452	0.387	0.194	0.194	0.452	0.516	0.258	0.258	0.065	0.129	0.129	0.129	5.165	65.0 31.96
0.452	0.323	0.194	0.258	0.452	0.258	0.129	0.387	0.129	0.129	0.129	0.129	0.129	0.129	5.100	60.0 31.81
0.323	0.258	0.194	0.323	0.194	0.194	0.258	0.129	0.129	0.129	0.129	0.129	0.129	0.129	4.971	55.0 31.61
0.065	0.258	0.323	0.323	0.323	0.323	0.258	0.258	0.258	0.129	0.065	0.065	0.065	0.065	4.648	50.0 31.49
0.387	0.194	0.323	0.323	0.065	0.129	0.194	0.323	0.194	0.194	0.065	0.065	0.065	0.065	5.294	45.0 31.37
0.710	0.258	0.065	0.194	0.258	0.129	0.065	0.129	0.258	0.194	0.065	0.065	0.065	0.065	4.648	40.0 31.22
0.194	0.323	0.129	0.452	0.129	0.194	0.129	0.129	0.129	0.129	0.065	0.065	0.065	0.065	4.584	35.0 31.06
0.065	0.387	0.194	0.323	0.065	0.129	0.194	0.323	0.194	0.194	0.065	0.065	0.065	0.065	5.617	30.0 30.94
0.258	0.194	0.323	0.258	0.065	0.129	0.194	0.194	0.194	0.194	0.065	0.065	0.065	0.065	5.229	25.0 30.74
0.129	0.323	0.258	0.258	0.065	0.129	0.194	0.194	0.194	0.194	0.065	0.065	0.065	0.065	5.036	20.0 30.59
0.194	0.194	0.194	0.129	0.065	0.065	0.065	0.129	0.065	0.065						

Table XV: Buttock-Knee Length Related to Shoulder Height, Sitting

A

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

Table XVI: Buttock-Knee Length Related to Knee Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

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Table XVII: Standing Height Related to Eye Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

EYE HEIGHT, SITTING		STANDING HEIGHT															
PCTLE	INCHES	1.0 65.09	2.0 65.51	3.0 65.78	5.0 66.20	10.0 66.93	15.0 67.52	20.0 67.87	25.0 68.19	30.0 68.58	35.0 68.94	40.0 69.29	45.0 69.53	50.0 69.84	55.0 70.20	60.0 70.54	65.0 70.87
99.0+	35.62																
99.0	34.50																
98.0	34.21																
97.0	33.92																
95.0	33.58																
90.0	33.11																
85.0	32.79																
80.0	32.55																
75.0	32.36																
70.0	32.12																
65.0	31.96																
60.0	31.81																
55.0	31.61																
50.0	31.49																
45.0	31.37																
40.0	31.22																
35.0	31.06																
30.0	30.94																
25.0	30.74																
20.0	30.59																
15.0	30.35																
10.0	30.07																
5.0	29.68																
3.0	29.38																
2.0	29.17																
1.0	28.77																
COL TOTALS		0.968	1.033	0.968	2.001	5.100	5.294	4.648	5.100	5.294	4.584	5.875	4.261	4.971	4.906	4.906	6.198
MEASUREMENTS		MEAN	STANDARD DEVIATION		RANGE	LOW	HIGH	REGRESSION EQUATIONS								STANDARD ERROR	
STANDING HEIGHT	69.94	2.333	13.62		63.50	77.13	Y = 5.419 + 0.374X	X = 24.292 + 1.446Y								SE Y·X =	
EYE HEIGHT-SITTING	31.57	1.187	7.56		28.07	35.63									SE X·Y =		
CORRELATION R = 0.735																	

Table XVIII: Standing Height Related to Buttock-Knee Length

BUTTOCK-KNEE LGTH		STANDING HEIGHT															
PCTLE	INCHES	1.0 65.09	2.0 65.51	3.0 65.78	5.0 66.20	10.0 66.93	15.0 67.52	20.0 67.87	25.0 68.19	30.0 68.58	35.0 68.94	40.0 69.29	45.0 69.53	50.0 69.84	55.0 70.20	60.0 70.54	65.0 70.87
99.0+	27.63																
99.0	26.51																
98.0	26.18																
97.0	26.02																
95.0	25.78																
90.0	25.39																
85.0	25.15																
80.0	24.92																
75.0	24.76																
70.0	24.56																
65.0	24.44																
60.0	24.33																
55.0	24.17																
50.0	24.05																
45.0	23.93																
40.0	23.81																
35.0	23.70																
30.0	23.55																
25.0	23.42																
20.0	23.22																
15.0	23.03																
10.0	22.83																
5.0	22.55																
3.0	22.32																
2.0	22.08																
1.0	21.83																
COL TOTALS		0.968	1.033	0.968	2.001	5.100	5.294	4.648	5.100	5.294	4.584	5.875	4.261	4.971	4.906	4.906	6.198
MEASUREMENTS		MEAN	STANDARD DEVIATION		RANGE	LOW	HIGH	REGRESSION EQUATIONS								STANDARD ERROR	
STANDING HEIGHT	69.94	2.333	13.62		63.50	77.13	Y = 0.843 + 0.332X	X = 26.414 + 1.806Y									SE Y·X =
BUTTOCK-KNEE LGTH	24.09	1.001	6.89		20.75	27.64									SE X·Y =		
CORRELATION R = 0.775																	

B

71 4.906 4.906 6.198 4.067 4.777 5.294 4.906 4.842 5.036 2.056 0.904 0.968 1.013 100-000

STANDARD ERROR OF ESTIMATE	PERCENTILE LEVELS						
	1.0	3.0	5.0	50.0	95.0	98.0	99.0
SE Y·X = 0.804	65.09	65.78	66.20	69.84	73.94	74.65	75.28
SE X·Y = 1.582	28.78	29.39	29.68	31.50	33.58	34.21	34.51

4.906 4.906 6.198 4.067 4.777 5.294 4.906 4.842 5.036 2.066 0.904 0.968 1.033 100.000

STANDARD ERROR OF ESTIMATE	1.0	3.0	PERCENTILE LEVELS				
			5.0	50.0	95.0	98.0	99.0
SE Y.X = 0.633	65.09	65.78	66.20	69.84	73.94	74.65	75.28
SE X.Y = 1.475	21.83	22.32	22.56	24.06	25.79	26.18	26.52

Table XIX: Standing Height Related to Knee Height, Sitting

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

Table XX: Standing Height Related to Sitting Height

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.064558%

13

STANDARD ERROR OF ESTIMATE	1.0	3.0	PERCENTILE LEVELS					
	5.0	50.0	95.0	98.0	99.0			
SE Y.X =	0.569	65.09	65.78	66.20	69.84	73.94	74.65	75.28
SE X.Y =	1.357	19.72	20.08	20.31	21.81	23.50	23.90	24.17

Table XXI: Thigh Circumference Related to Eye Height, Sitting

A

ENTRIES REPRESENT PERCENTAGES OF 1549 SUBJECTS ONE SUBJECT = 0.964558%

EYE HEIGHT, SITTING PCTILE INCHES	THIGH CIRCUM- PCTILE INCHES															1.0 2.0 3.0 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0 45.0 50.0 55.0 60.0 65.0			
	18.72	19.41	19.66	20.04	20.59	20.94	21.34	21.57	21.85	22.09	22.28	22.46	22.64	22.83	23.03	23.23			
99.0+	35.62																	0.129	
99.0	34.50																	0.065	
98.0	34.21																	0.065	
97.0	33.92																	0.065	
95.0	33.58																	0.065	
90.0	33.11																	0.065	
85.0	32.79																	0.065	
80.0	32.55																	0.065	
75.0	32.36																	0.065	
70.0	32.12																	0.065	
65.0	31.96																	0.065	
60.0	31.81																	0.065	
55.0	31.61																	0.065	
50.0	31.49																	0.065	
45.0	31.37																	0.065	
40.0	31.22																	0.065	
35.0	31.06																	0.065	
30.0	30.94																	0.065	
25.0	30.74																	0.065	
20.0	30.59																	0.065	
15.0	30.35																	0.065	
10.0	30.07																	0.065	
5.0	29.68																	0.065	
3.0	29.38																	0.065	
2.0	29.17																	0.065	
1.0	28.77																	0.065	
	COL TOTALS	0.968	1.162	0.839	2.066	5.358	5.100	5.294	4.390	5.358	4.5.9	5.746	4.132	5.617	4.584	4.842	5.810		

MEASUREMENTS	MEAN	STANDARD DEVIATION	RANGE	LOW	HIGH	REGRESSION EQUATIONS			STANDARD ERROR
						Y = 28.361 + 0.142X	X = 14.664 + 0.252Y		
THIGH CIRCUM-	22.63	1.583	10.94	17.24	28.19				
EYE HEIGHT, SITTING	31.57	1.187	7.56	28.07	35.63				
CORRELATION R = 0.189									

B

																		ROW TOTALS	EYE HEIGHT-SITTING PCTLE INCHES												
50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	97.0	98.0	99.0	99.0+				1.033	99.0+ 35.62													
22.64	22.83	23.03	23.23	23.43	23.70	23.94	24.17	24.57	25.20	25.61	25.98	26.30	28.19				0.710	99.0 34.50													
0.065	0.065		0.129	0.065		0.065		0.129	0.065	0.065							1.291	98.0 34.21													
0.065		0.065	0.129	0.065	0.065	0.129	0.065		0.129	0.065	0.065	0.065					1.937	97.0 33.92													
0.129		0.129		0.065	0.194	0.194	0.129		0.323		0.065	0.065					4.713	95.0 33.58													
0.258	0.387	0.194	0.387	0.452	0.387	0.065	0.194	0.129	0.258	0.194	0.194	0.194	0.194				4.777	90.0 33.11													
0.387	0.258	0.258	0.387	0.258	0.194	0.194	0.129	0.387	0.387	0.258		0.194					5.229	85.0 32.79													
0.323	0.065	0.323	0.323	0.129	0.258	0.129	0.258	0.323	0.323	0.581	0.065	0.129	0.065				4.648	80.0 32.55													
0.194		0.065	0.194	0.258	0.194	0.258	0.194	0.323	0.323	0.387	0.387	0.065	0.129	0.065			5.487	75.0 32.36													
0.516	0.323	0.387	0.194	0.387	0.323	0.194	0.516	0.323	0.323	0.194		0.065	0.065	0.065			4.842	70.0 32.12													
0.258	0.516	0.129	0.258	0.258	0.387	0.194		0.581	0.129	0.065	0.129						5.165	65.0 31.96													
0.516	0.258	0.258	0.452	0.194	0.323		0.194	0.129	0.323	0.194	0.129	0.065	0.194				5.100	60.0 31.81													
0.194	0.323	0.323	0.258	0.194	0.258	0.323	0.452	0.323	0.323	0.129	0.258	0.065	0.065	0.065			4.971	55.0 31.61													
0.323	0.258	0.516	0.129	0.129	0.129	0.387	0.516	0.452	0.258	0.129	0.065						4.648	50.0 31.49													
0.129	0.194	0.452	0.129	0.452	0.323	0.387	0.258	0.194	0.387	0.065							5.294	45.0 31.37													
0.258	0.065	0.323	0.516	0.065	0.258	0.194	0.258	0.129	0.258	0.129	0.065						4.648	40.0 31.22													
0.258	0.258	0.129	0.258	0.194	0.129	0.129	0.323	0.387	0.387	0.065	0.065						4.584	35.0 31.06													
0.194	0.387	0.129	0.258		0.387	0.129	0.323	0.452	0.065	0.129	0.065	0.065					5.617	30.0 30.94													
0.258	0.258	0.258	0.323	0.323	0.258	0.323	0.194	0.194	0.129	0.129	0.065	0.065	0.065				5.229	25.0 30.74													
0.323	0.129	0.452	0.323	0.323	0.258	0.194	0.452	0.258	0.065		0.129	0.065					5.036	20.0 30.59													
0.258	0.065	0.129	0.258	0.258	0.065	0.065	0.065	0.323	0.065	0.129						5.036	15.0 30.35														
0.194	0.129	0.258	0.387	0.258	0.323	0.129	0.065	0.194								4.842	10.0 30.07														
0.258	0.323	0.194	0.387	0.194	0.194	0.323	0.323	0.194	0.194							2.195	5.0 29.68														
0.065	0.065	0.129	0.194			0.258										0.904	3.0 29.38														
0.065	0.065			0.065	0.065		0.065		0.129			0.065	0.065				1.097	2.0 29.17													
0.194				0.065	0.065	0.065		0.065								0.968	1.0 28.77														
5.617	4.584	4.842	5.810	4.842	4.842	4.584	5.036	5.358	4.713	1.808	1.162	0.904	0.968			100.000															
STANDARD ERROR OF ESTIMATE																1.0	3.0	PERCENTILE LEVELS													
	SE Y.X =	1.165		18.72	19.66	20.04	22.64	25.20	25.98	26.30																					
	SE X.Y =	1.555		28.78	29.39	29.68	31.50	33.58	34.21	34.51																					

REFERENCES

1. Gifford, F., Provost, J., and Lazzo, J., Anthropometry of naval aviators - 1964. NAEC-ACEL 533. Philadelphia, Pa.: Naval Air Engineering Center, Air Crew Equipment Laboratory, 1965. (AD 626 322)
2. Hertzberg, H. T. E., Daniels, G. S., and Churchill, E., Anthropometry of flying personnel - 1950. WADC TR 52-321. Wright-Patterson Air Force Base, Ohio: Wright Air Development Center, 1954. (AD 47 953)

APPENDIX A

DEFINITIONS OF ANTHROPOMETRIC FEATURES

Bideltoid Diameter*	is the horizontal distance between the maximum lateral protruion of the deltoid muscles. This measurement is taken with the subject sitting erect, upper arms hanging at his sides, and his forearms extended horizontally.	Knee Height, Sitting is the vertical distance from the horizontal surface on which the subject's feet are resting to the top of his right knee. This measurement is taken with his feet resting on a surface so that the knees are bent at about right angles.
Buttock-Knee Length	is the horizontal distance from the rearmost point of the right buttock to the front of the kneecap. The measurement is taken with the subject seated erect and his feet resting on a surface so that his knees are bent at about right angles.	Shoulder Height, Sitting is the vertical distance from the sitting surface to the right acromion. The measurement is taken with the subject sitting erect, both feet resting on a surface so that his knees are bent at about right angles.
Eye Height, Sitting	is the vertical distance between the sitting surface and the inner corner of the eye (internal canthus). The measurement is taken with the subject sitting erect, looking directly forward, with his feet resting on a surface so that his knees are bent at right angles.	Sitting Height is the vertical distance from the sitting surface to the top of the head. The measurement is taken with the subject sitting erect, looking directly ahead, and his feet resting on a surface so that his knees are bent at about right angles.
Functional Reach	is the distance from a wall, against which the standing subject's shoulders are pressed, to the tip of his thumb. This measurement is taken with the subject's right arm and hand extended horizontally and the thumb and forefinger pressed together.	Standing Height is the vertical distance from the floor to the top of the subject's head. This measurement is taken with the subject standing erect and looking directly ahead.
Head Height	is the vertical distance from the cartilaginous notch (tragion) just forward of the upper edge of the right ear hole to the highest point of the head, with the arm of the anthropometer firmly touching the scalp.	Thigh Circumference is the circumference of the right thigh, measured by holding a tape in a horizontal plane just below the lowest point in the gluteal furrow. This measurement is taken with the subject standing with his legs slightly apart.

*These definitions were derived from the definitions presented in a report by Hertzberg, Daniels, and Churchill. The same report also contains illustrations of the features described above (reference 2 of text).

PROCEDURE FOR UTILIZING STANDARD ERROR OF ESTIMATE

APPENDIX B

This section illustrates a procedure for utilizing the regression equation and the standard error of estimate. For the sake of illustration, assume that for a given functional reach (28.86 inches), it is required to estimate an individual's sitting height. Using the data presented in Table I, the following steps should be followed:

1. Insert the value of x (in this illustration functional reach) into the regression equation
 $y = 25.812 + 0.332x.$
2. Solve for y (in this case $y = 35.394$).
3. Using the standard error of estimate specified (1.156), determine the desired limits as follows:
 - a. 66.6 per cent of the time $(1 - x \cdot 1.156) = 1.156$
 - b. 95 per cent of the time $(1.96 \cdot 1.156) = 2.266$
 - c. 99 per cent of the time $(2.58 \cdot 1.156) = 2.982$
4. Calculate the range of predicted sitting heights by adding and subtracting the values obtained in step 3 from the value obtained in the regression equation.
 - a. 66.6 per cent of the time: $35.394 + 1.156 = 34.238$ to 36.550 inches
 - b. 95 per cent of the time: $35.394 + 2.266 = 32.126$ to 37.660 inches
 - c. 99 per cent of the time: $35.394 + 2.982 = 32.412$ to 38.376 inches
5. Interpretation: Given a functional reach of 28.86 inches, the subject's sitting height will fall within the following ranges:
 - a. 66.6 per cent of the time between 34.238 and 36.550
 - b. 95 per cent of the time between 32.128 and 37.660
 - c. 99 per cent of the time between 32.412 and 38.376

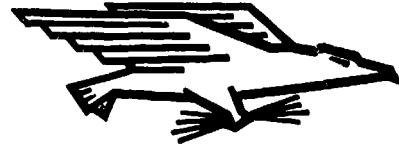
APPENDIX C

CRITIQUE SHEET AND MAILER

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